

Strategic Highway Safety Plan for Vermont

4. Analysis of Critical Emphasis Areas

In order to identify the appropriate set of strategies that is most likely to contribute to the 30% goal reduction in major crashes expressed in Section 2.2, an in-depth analysis and evaluation of the seven critical emphasis areas needed to be made. The Vermont Center for Justice Research (VCJR) was retained for this task. Building on the analysis made for the identification of the critical emphasis areas and using the reported crash data for the 1999 to 2003 period (most recent available five years), the Vermont Center for Justice Research generated cross tabulations, tables, and graphs that detailed the key characteristics of the problems for each of the areas. Roadway inventory data was also used to generate relevant cross tabulations and correlations as needed. In addition, to supplement the analysis of the selected emphasis areas and to identify patterns and information that would not have been readily apparent by simply reviewing the usual crash data, the Vermont Center for Justice Research reviewed the fatal crash reports that were available for the period May 31, 2004 to May 31, 2005.

The aim of the analysis was to provide information that detailed the characteristics of the problems to allow the identification of mitigating measures for eliminating or reducing the identified problems within each area. The next subsections describe the results of this analysis¹. For each emphasis area, the extent of the problem and the contributing factors are evaluated. Other issues are also listed as appropriate.

4.1 Keeping Vehicles on the Roadway & Minimizing the Consequences of Leaving the Road

4.1.1 Historical Trend

Table 6 summarizes the historical trend in major crashes for vehicles that left the road for the 1999 to 2003 reporting period. Although the percentage of major run-off-the road crashes initially declined during the five-year period, this percentage increased again towards the end of the period, and was essentially the same at the end of the period as at the beginning.

The percentages associated with various consequences of running off the road in a major crash fluctuated during the time period, but no real trends are apparent. A vehicle overturning or colliding with a tree or large bush were the most common consequences of running off the road in a major crash and represented slightly more than 50% of all the consequences resulting from running off the road crashes.

Table 6. Historical Trend 1999-2003 (percent of major crashes)

Crash Types	1999		2000		2001		2002		2003	
	N	%	N	%	N	%	N	%	N	%
Keeping Vehicles on the Roadway	191	42%	180	38%	172	31%	167	40%	191	43%

¹ In this data analysis, the time periods are defined as follows: Evening (6:00 p.m. to 10:00 p.m.), Night (10:00 p.m. to 2:00 a.m.), Early morning (2:00 a.m. to 6:00 a.m.), Morning (10:00 a.m. to 2:00 p.m.) and Afternoon (2:00 p.m. to 6:00 p.m.).

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Minimizing the Consequences of Leaving the Road

- Overturned	27%	23%	28%	31%	26%
- Collision with tree/large bush	31%	25%	25%	25%	28%
- Collision with pole/sign	10%	16%	15%	14%	11%
- Collision with guard rail/curb	14%	14%	10%	10%	15%
- Collision with other fixed object	9%	17%	13%	11%	12%
- Collision with ledge/boulder	8%	6%	8%	10%	8%

4.1.2 Extent of the Problem

The number of run-off the road crashes by county shows that Chittenden County had the highest percentage (14.4%) of crashes followed by Windham (11.2%), Franklin (9.5%) and Windsor (9.4%) counties.

The highest proportions of run-off the road crashes occurred on state highways (43.0%) and on city/village roadways (30.2%). In comparing the distribution for run-off the road crashes to the 2003 distribution for all crashes, it can be seen that far more run-off the road crashes occur on city/village roads (30.2%) compared to all crashes (12.5%).

Slightly more than 42% of these crashes occurred on highways with a 50 mph posted speed limit.

Male operators represented a large proportion (68.6%) of the operators in these crashes with female operators accounting for 31.4%.

The average annual crash rate per licensed drivers was the highest for 17 year olds at 1.26 crashes per licensed drivers. Young drivers in other age groups also had a high rate per licensed drivers when compared to older drivers. Specifically the crash rate for the 18-20 year olds group was 1.06 and it was 1.04 for the 16 year olds group compared to 0.34 for the 25-34 year olds group, and 0.15 for the 55-64 year olds one.

A large proportion of passenger cars (52.8%), sport utility vehicles (60.9%) and light trucks/vans (62.4%) either overturned or hit a tree. Large trucks (81.1%) and motorcycles (60.3%) typically overturned or hit a guardrail. For all vehicles, the proportions for hitting a tree or overturning were the same at 26.9% each.

4.1.3 Contributing Factors

Almost one third of the crashes took place in wet or snowy conditions (snow/ice/slush, 16.3%; wet road surfaces, 13.4%).

Low light or dark conditions represented approximately 42% of the lighting conditions in which run-off the road crashes happened (dusk, 4.9%; dark, 36.7%).

Of the 901 run-off the road crashes reviewed during the study period, there were 186 crashes with available data on curvature degrees. Almost 84% of these crashes occurred on curves ranging between 2 and 10 degrees. Most of the curves in the 2.01-5 range were short curves below 0.1 miles (82.5%). Similarly, about half of the crashes on

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curves of 5 to 10 degrees were short curves of less than 0.1 miles. Very few crashes occurred on curves larger than 14 degrees (7.0%).

Table 7. Curvature Degrees by Curve Length in Miles, 1999-2003

Curvature Degrees*	Curve Length in Miles										Total	
	0.01-0.05		0.051 - 0.1		0.101-0.2		0.201-0.3		>0.3			
	N	%	N	%	N	%	N	%	N	%	N	%
2.01-5	47	43.1%	43	39.4%	15	13.8%	3	2.8%	1	0.9%	109	100.0%
5.01-10	23	48.9%	15	31.9%	9	19.1%	0	0.0%	0	0.0%	47	100.0%
10.01-14	7	41.2%	2	11.8%	8	47.1%	0	0.0%	0	0.0%	17	100.0%
14.01-20	4	44.4%	3	33.3%	2	22.2%	0	0.0%	0	0.0%	9	100.0%
20.01-30	0	0.0%	2	100.0%	0	0.0%	0	0.0%	0	0.0%	2	100.0%
>30	1	50.0%	1	50.0%	0	0.0%	0	0.0%	0	0.0%	2	100.0%
Total	82	44.1%	66	35.5%	34	18.3%	3	1.6%	1	0.5%	186	100.0%

*Negative values for curvature degrees were converted to an absolute value.

Driving too fast for conditions was a common occurrence in run-off the road crashes with 23.1%. Other common factors contributing to run-off the road crashes were failure to keep in proper lane/off road (16.3 %), driving under the influence of medication/drugs/alcohol (11.4%), excessive speed (9.1%) and falling asleep (7.6%).

Based on the definition of alcohol related crashes, almost 30% of the run-off the road crashes reviewed during the 1999-2003 period were alcohol related. This is reflected in the number of citations issued in major run-off the road crashes with almost 25% being for DUI.

Overall, for this type of crash, restraint use was relatively low with only 52.8 % of the vehicle occupants using a restraint.

4.1.4 Other Issues

4.2 Improving Young Driver Safety

4.2.1 Historical Trend

During the 1999 to 2003 reporting period, the percentage of crashes involving drivers under age 21 ranged between 25% and 30%. Percentages fluctuated somewhat from year to year and no clear pattern or trend is evident as shown in Table 8.

Table 8. Historical Trend 1999-2003 (percent of major crashes)

Crash Types	1999		2000		2001		2002		2003	
	N	%	N	%	N	%	N	%	N	%
Drivers under the age of 21	122	27%	143	30%	136	25%	111	27%	124	28%

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4.2.2 Extent of the Problem

Between 1999 to 2003, the largest number (22.3%) of major crashes involving young drivers occurred in Chittenden County followed by Rutland (9.9%), Franklin (8.5%) and Windham (8.3%).

Over half (55.0%) of the crashes involving young drivers occurred on state highways and more than one third happened on city/village roadways (24.8%) or town roads (14.3%). Interstate crashes represented slightly more than 4% of this type of crashes.

Sixty percent of the young drivers involved in young driver crashes were male and 40% were female drivers as shown in Table 9.

Table 9. Age and Sex of Operators Involving Drivers under Age 21, 1999-2003

Age	Male		Female		Total	
	N	%	N	%	N	%
15	13	59.1%	9	40.9%	22	3.3%
16	44	50.0%	44	50.0%	88	12.9%
17	81	58.3%	58	41.7%	139	20.4%
18	107	62.6%	64	37.4%	171	25.1%
19	93	62.8%	55	37.2%	148	21.7%
20	73	64.6%	40	35.4%	113	16.6%
Total	411	60.4%	270	39.6%	681	100.0%

The table shows that 18 year olds comprised the largest number of crash operators (25.1%) followed by 19 year olds (21.7%) and 17 year olds (20.4%).

Crash rates per young licensed drivers increase from age 15 to a peak at age 18 and then decline after age 18. The highest rates per licensed drivers were found to be for 17, 18 and 19 year olds at 3.50, 4.07 and 3.42, respectively.

4.2.3 Contributing Factors

When compared to the all crashes for 2003, proportionally fewer young driver crashes occurred from December through May while proportionally more happened from June through September as well as in November. More specifically, peak crash percentages occurred in July (11.3%) and January (10.5%) while the months of May, April and March had the lowest percentage of crashes (5.8% to 6.8%).

Above average numbers of young driver crashes took place between Friday and Monday, with the highest number of these crashes occurring on Saturday (18.1%). In comparison, percentages during the rest of the week vary from 11.0% to 13.7%.

In terms of time of day, the number of crashes per hour by time of day was the highest every day of the week during the afternoon hours between 2-6 pm. Monday, Sunday and Saturday had the highest number of crashes for this time period.

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Almost 80% of major young driver crashes occurred under clear or cloudy conditions, compared to about 9% when it was snowing or almost 8% when it was raining.

Of the passengers riding with a young driver, 58.7% were male and 41.3% were female. Most passenger were found to be young and between the ages of 15-24 (76.8%) with almost 41% being in the 15-17 age group and another 25% being in the 18-20 age range.

Speeding either in the form of driving too fast for conditions (19.1%) or driving at an excessive speed (7.7%) was the most prevalent contributing circumstances in young driver major crashes. Failure to yield (11.7%) and inattention (9.2%) were the next most prevalent contributing circumstances. Alcohol related crashes represented 11% of all the young driver crashes.

An examination of citations issued to drivers under the age of 21 involved in major crashes indicates that (20.2%) were written for speeding. Alcohol related citation accounted for 14.2% of the citation issued with 7.4% for DUI and 6.8% for under 18/21 & .02% or more alcohol concentration, minor (16+) consumption/possession of alcohol and consuming alcohol while driving.

Overall, 66.0% young drivers involved in a major crash were using a restraint. Restraint use was the highest for the 17 year olds at 73.5% while the lowest was for 20 year olds at 54.3%.

4.2.4 Other Issues

In the most recent Vermont Youth Risk Behavior Survey, over 22% of students in grades 9 to 12 indicated that with the past 30 days, they had ridden in a car or other vehicle driven by someone who had been drinking alcohol.

The Centers for Disease Control have identified Unintentional Injury as the leading cause of death for ages 15 to 24 and Unintentional Injury-Motor Vehicle Occupant as the second leading cause of non-fatal emergency department visits for the same ages.

4.3 Improving the Design and Operation of Highway Intersections

4.3.1 Historical Trend

Over this period and as illustrated in Table 10, the percentage of major crashes that occurred at an intersection increased considerably (from 18% to 30%), but then declined to an only slightly higher level in 2003 than in 1999 (21% versus 18%).

Table 10. Historical Trend 1999-2003 (percent of major crashes)

Crash Types	1999		2000		2001		2002		2003	
	N	%	N	%	N	%	N	%	N	%
Crashes at Intersections	82	18%	143	30%	163	30%	97	23%	95	21%

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4.3.2 Extent of the Problem

Slightly more than 50% of major crashes at intersections occurred in the more densely populated areas of Chittenden County (27.9%), Bennington County (12.8%) and Rutland County (9.7%).

Almost 70% of these crashes occurred on state highways, while 20.2% happened on town highways and 9.8% on city/village highways.

When looking at the posted speed, 65.1% of these crashes happened in the lower posted speed ranges of 25-40 miles per hour while 32.5% occurred in the 50-65 miles per hour range.

In terms of type of intersection, 66.2% of these crashes happened at T-intersections, while 27.4% occurred at four-way intersections and 6.4% at Y-intersections.

An examination of the type of traffic control present indicates that over 55% took place at intersection controlled by stop signs. In contrast only 5% of the crashes were at a traffic signals.

For the crashes where the 2000 average annual daily traffic volume was available, 39% occurred at an intersection with an average annual daily traffic volume range of 10,000+, and about 28% each for traffic volume ranges 5,000-9,999 and 2,000-4,999.

A larger proportion of operators involved in major crashes at intersection were male as opposed to female operators (58.3% vs 41.7%). However, these proportions are very similar to the proportions of drivers in all 2003 crashes.

4.3.3 Contributing Factors

Almost 73% of the major crashes at intersections took place on dry roads while the remainder took place on wet roads (18.1%), or roads covered with snow, ice or slush (6.0%). Furthermore, almost 72% of these crashes occurred in daylight conditions while darker conditions represented about 26% of these crashes (dusk, 3.8%; dark, 13.3% or dark with streetlights, 9.1%).

Of the major crashes at T-intersections, almost 58% were right-angle crashes. Rear-end crashes represented the second largest proportion of crashes at this type of intersection with about 17%. Other important category of crashes was single vehicle crashes (8.6%), head-on crashes (7.0%) and left-turn crashes (4.2%).

Combined, Failure to yield (27.6%), inattention (10.7%) and disregarding traffic signs or signals (9.2%) represented more than 47% of the contributing circumstances of operators in major crashes occurring at an intersection. The other two contributing circumstances of importance were driving too fast for conditions and following too closely with each representing 5.8% of the crashes.

An examination of the frequency distribution for citations issued in major crashes occurring at an intersection indicates 21.6% of the citations were written for failure to yield and 13.0% for DUI.

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The proportion of alcohol-related crashes at intersection was almost doubled of that for all 2003 crashes (13.3% vs 6.8%).

With respect to restraint, it was found that 77.5% of the occupants were using a restraint.

4.3.4 Other Issues

4.4 Increasing Seat Belt Use

4.4.1 Historical Trend

During the 1999 to 2003 reporting period, the percentage of vehicle occupants fatally/severely injured who were not using a restraint device, including any forms of seat belts, child restraint and air bags, declined substantially before leveling off in recent years (31% percent of fatalities/severe injuries in 1999 compared to 22% in 2003).

Table 11. Historical Trend 1999-2003 (Percent of fatalities/incapacitating injuries)

Crash Types	1999		2000		2001		2002		2003	
	N	%	N	%	N	%	N	%	N	%
Vehicle occupants fatally/severely injured not using a restraint device	183	31%	157	25%	163	22%	113	22%	123	22%

4.4.2 Extent of the Problem

Overall, 50% of those who died in a fatal crash were unrestrained.

A look at restraint use by age of operators in major crashes indicates that slightly more than 20% of the operators were unrestrained. Lower restraint use among operators was found for the 18-20 and 21-24 year olds at 62.7% and 66.0%, respectively.

On the other hand, passengers had a lower rate of restraint use. More than 26% of the passengers in major crashes were unrestrained with the lowest percentages of restraint use for the age groups 15-17 (55.3%), 18-20 (50.4%), 21-24 (49.5%) and 35-39 year olds (54.3%).

4.4.3 Contributing Factors

Overall restraint use for pickup truck vehicle occupants was lower than for the large trucks (72.9%), passenger cars (72.6%) or sport utility vehicles (68.7%). Specifically, of those driving in pickup trucks and who were involved in a major crash, 58.8% were using a restraint.

4.4.4 Other Issues

NCHRP Report 500, Volume 11 reports the following:

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- NHTSA estimates that lap/shoulder belts reduce the risk of fatal injury by 45% and moderate to critical injury by 50% for front seat occupants who are older than 5 years.
- The Governor's Highway Safety Program reports that statewide, the percentage of total occupants wearing a seatbelt passed from 78.2% to 81.8% at the end of the 2006 Click it or Ticket mobilization.

4.5 Reducing Impaired Driving

4.5.1 Historical Trend

The percentage of major crashes related to alcohol declined from 24 percent of major crashes in 1999 to 16 percent of major crashes in 2001, but then increased to 19 percent in 2003. Although the percentage of alcohol-related major crashes was less in 2003 than in 1999, the percentage rose noticeably between 2002 and 2003, which may reflect the start of an upward trend.

Table 12. Historical Trend 1999-2003 (percent of major crashes)

Crash Types	1999		2000		2001		2002		2003	
	N	%	N	%	N	%	N	%	N	%
Alcohol related	108	24%	90	19%	87	16%	69	17%	85	19%

4.5.2 Extent of the Problem

The Vermont Problem Drinker Population in 2004 was estimated at 90,044 persons. From the 2005 Behavioral Risk Factor Surveillance System survey (BRFSS), the Vermont Department of Health estimated the number of episodes of driving after drinking too much at about 184,000 per year.

As can be seen from the distribution of blood alcohol concentrations for tested operators of different age groups shown in Table 13, blood alcohol concentration increases with age (peaking at age 25-29), fluctuates somewhat, and decreases among the upper age groups. Fewer than half of vehicle operators in the youngest two age groups (15-17 and 18-20) and in the oldest age group (50 and older) had blood alcohol levels of 0.12 or higher, while more than half of those in the remaining age groups did so. Thus, younger and older drivers involved in alcohol-related crashes are more likely to be causing a crash at lower BAC levels than in other age groups. Notably, among crashes involving operators aged 35-39, 42.3% had blood alcohol levels of 0.20 or higher, as did nearly 30% of those aged 30-34, 40-44, and 45-49. Overall, 20% of operators had blood alcohol levels of 0.20 and higher.

Table 13. Operator Blood Alcohol Concentration by Age Group, Tested Operators, 1999-2003

Age Group	Blood Alcohol Concentration												%0.08% or Above
	.039 or less		.040-.079		.080-.119		.120-.159		.160-.199		.20 & above		
	N	%	N	%	N	%	N	%	N	%	N	%	
15 to 17 years	3	37.5%	0	0.0%	2	25.0%	2	25.0%	0	0.0%	1	12.5%	62.5%
18 to 20	3	11.1%	7	25.9%	7	25.9%	3	11.1%	6	22.2%	1	3.7%	63.0%

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21 to 24	2	4.9%	11	26.8%	5	12.2%	11	26.8%	8	19.5%	4	9.8%	68.3%
25 to 29	0	0.0%	3	16.7%	3	16.7%	5	27.8%	4	22.2%	3	16.7%	83.3%
30 to 34	6	22.2%	0	0.0%	3	11.1%	7	25.9%	3	11.1%	8	29.6%	77.8%
35 to 39	3	11.5%	3	11.5%	2	7.7%	2	7.7%	5	19.2%	11	42.3%	76.9%
40 to 44	2	7.4%	3	11.1%	5	18.5%	5	18.5%	4	14.8%	8	29.6%	81.5%
45 to 49	4	22.2%	1	5.6%	3	16.7%	2	11.1%	3	16.7%	5	27.8%	72.2%
50 & older	11	42.3%	2	7.7%	3	11.5%	4	15.4%	3	11.5%	3	11.5%	50.0%
Total	34	15.6%	30	13.8%	33	15.1%	41	18.8%	36	16.5%	44	20.2%	70.6%

The largest percentage of crashes occurred in Chittenden County (17.1%), the most densely populated county in Vermont. Close to ten percent of crashes occurred in each of the following counties: Windsor (9.8%); Windham (9.6%); Franklin (9.3%) and Rutland (9.1%).

Slightly less than 50% took place on city/village streets (26.9%) or town roads (15.7%). Interstate crashes represented about 5% of all alcohol related crashes.

Seventy-nine percent of the operators involved in alcohol-related crashes were male, and 21% were female.

4.5.3 Contributing Factors

Alcohol-related crashes peaked during the summer months (10% of alcohol-related crashes occurred in June, 11.8% in July, and 9.6% in August), although 10% of crashes occurred in December.

Most alcohol-related major crashes occurred between Friday and Sunday (62.2%). Examining day and time information shows that the greatest number of crashes occurred on Saturday night and on Friday night between 10:00 p.m. and 2:00 a.m., with more than 50% of all alcohol related crashes occurring during that time. Other time periods with substantial numbers of crashes include Friday evening, Saturday early morning, afternoon and evening, and Sunday early morning, afternoon, evening and night (combining 35.3% of the crashes).

Younger operators (less than age 25) were most likely to be involved in crashes during nighttime and early morning hours. Crashes involving operators in the middle-aged groups (25-54) were more evenly distributed across afternoon, evening, and nighttime hours. Operators aged 55-64 were most likely to be involved in crashes during evening hours (54.5% of crashes). For those aged 65-74, midday was the most frequent time for alcohol-related crashes (37.5%), followed by morning (25%). Crashes involving operators aged 75 and older were most common during midday and afternoon hours (33.3% during each time period).

The most common types of citation given to an operator involved in an alcohol related major crash was driving under the influence (42.6%), driving while license suspended (8.4%), "operating without insurance (6.4%), and speeding (4.6%).

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Restraint use by occupants in the alcohol related vehicles was relatively low with only 39.7% of the vehicle occupants using a restraint.

4.5.4 Other Issues

The 2004 VT BRFSS survey on the likelihood of being stopped by police when driving after drinking showed that 36% of the respondents felt that they were unlikely of being stopped compared to a very similar percentage of respondents that felt that they were somewhat likely of being stopped. Only 20% felt that they were certain or very likely of being stopped.

The 2001 NHSTA Assessment Team of the Vermont System found that there appeared to be some instances of reductions from DUI to Careless and Negligent driving and reduction of second third and subsequent offense to first time DUI. They also found that the involvement of the judiciary in the administrative suspension process (civil hearing is combined with the arraignment hearing for the criminal charge) had occasionally involved plea bargaining the disposition between the two which has the net effect of reducing the certainty of suspension for violating the driving law.

NCHRP Report 500, Volume 16 reports the following:

- Individual may make anywhere from 50 to 200 impaired trips before being arrested.
- Focusing only on those who have been previously arrested will miss a large part of the problem.
- About one quarter of all persons convicted for a first DWI offense are estimated to be alcohol dependent.
- General deterrence strategies apply to the entire driving population. They hold the greatest potential to substantially reduce impaired driving and alcohol-related crashes (prevents impaired driving before it occurs).
- Specific deterrence strategies focus on those who have been arrested to discourage a repeat of the behavior.
- DWI laws and enforcement are empty threats without effective prosecution, adjudication, and punishment of offenders.
- Swiftness and certainty of the consequences are more important than severity. Paying attention to the possibility of alcohol impairment among persons stopped for speeding or seatbelt violations is particularly promising because these behaviors often occur in conjunction with drinking.
- Much greater publicity and enforcement of laws is needed for the full potential of these laws to be realized.

4.6 Curbing Speeding and Aggressive Driving

4.6.1 Historical Trend

Table 14 shows that speed and other forms of aggressive driving (following too closely or driving in erratic, reckless or aggressive manner) contributed to 15 percent of major crashes in three of the five years of the study period. In the remaining two years,

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percentages were 17 percent and 12 percent, which represents fairly normal fluctuations.

Table 14. Historical Trend 1999-2003 (percent of major crashes)

Crash Types	1999		2000		2001		2002		2003	
	N	%	N	%	N	%	N	%	N	%
Excessive speed, following too closely or driving in erratic, reckless or aggressive manner as a contributing factor	70	15%	79	17%	68	12%	61	15%	69	15%

4.6.2 Extent of the Problem

Almost 60% of the major crashes in which aggressive driving played a role occurred in the following four counties: Chittenden (25.9%), Windham (11.2%), Bennington (11.0%) and Windsor (9.8%).

More than half of crashes involving aggressive driving occurred on state highways (57.3%). Far fewer crashes occurred on town (16.4%), city/village (16.4%), and interstate (8.1%) types of roadways. Crashes involving aggressive driving were more likely than all 2003 crashes to take place on state highways (57.3% vs. 44.3%) and city/village roadways (16.4% vs. 12.5%).

Approximately two-thirds of the operators involved were male (65.2%), and one-third were female (34.8%). Males were most heavily represented within the 65-74, 18-20, and 35-44 age groups, where they made up 73.7%, 73%, and 70.9% of operators in major crashes involving aggressive driving. Overall, operators involved in this type of crash are most highly represented in the 25-34 and 35-44 age groups, with 18% of operators in each group.

4.6.3 Contributing Factors

Major crashes involving aggressive driving were most likely to occur during the day between 6:00 am to 6:00 pm (70.2%) with 28.3% taking place during afternoon hours. Slightly less than 50% of the crashes occurred between Friday and Sunday.

The most frequent contributing circumstances for major crashes involving aggressive drivers were excessive speed (27.2%), following too closely (20%), and operating vehicle recklessly (19.5%).

Alcohol was a factor in almost 24% of this type of crash. This contrasts with the 6.8% of all reported crashes during the study period in which alcohol was determined to be a factor.

4.6.4 Other Issues

4.7 Keeping Drivers Alert

4.7.1 Historical Trend

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The percentage of major crashes listing inattention, fatigue or the driver falling asleep as a contributing factor increased between 1999 (12 percent) and 2001 (15 percent), declined slightly in 2002 (14 percent), then increased again in 2003 (16 percent). These could reflect normal fluctuations, or an upward trend since the percentage in 2003 is the highest for the five-year period.

The percentage of major crashes that appeared to have been caused by a driver being fatigued or falling asleep increased substantially during the last two years of the period, although they still comprise a small percentage of all major crashes. In 1999, two percent of major crashes involved drivers who were fatigued or fell asleep, but in 2003, seven percent of major crashes did.

Table 15. Historical Trend 1999-2003 (percent of major crashes)

Crash Types	1999		2000		2001		2002		2003	
	N	%	N	%	N	%	N	%	N	%
Inattention or fatigued, asleep as contributing factor	56	12%	65	14%	84	15%	59	14%	72	16%
Listing driver's condition as fell asleep, fatigued	7	2%	6	1%	12	2%	26	6%	33	7%

4.7.2 Extent of the Problem

The vast majority of inattention crashes occurred on state highways (60.8%). The other one third of these crashes took place on town highways (13.7%), interstates (11.8%) and city/village roads (11.0%).

Of the operators involved in inattention crashes, 60.3% were male and 39.7% were female. The crash rate per 1,000 licensed drivers was the largest for young operators in the age categories of 16 (0.53), 17 (0.55), 18-20 (0.50) and 21-24 (0.40). This rate dropped to below 0.21 crashes per licensed drivers for the age groups above 24 years of age.

4.7.3 Contributing Factors

Proportionally more of the inattention crashes occurred in rural locations (62%) than in urban locations (37.8%). Further more, proportionally more rural crashes occurred on a main road (70.0% vs. 44.2%) while proportionally more urban crashes occurred at an intersection (32.5% vs. 18.9%) or at a driveway (7.2% vs. 2.6%).

In terms of time of day, slightly more than a third of these crashes occurred in the afternoon, between 2:00 p.m. and 6:00 p.m. and another quarter (24.9%) happened during midday (10 a.m. -2 p.m.). Nighttime crashes between the hours of 10:00 pm and 6:00 am, accounted for 12.1% of the crashes under this emphasis area.

Contributing circumstances by highway class indicates that inattention accounted for the largest percentage of all contributing circumstances for state, town and city/village roadways (44.6%, 48.4% and 46.3%, respectively). Overall, falling asleep (15.7%) was

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the next most common cause for these roadways, followed by failure to yield (8.8%) and failure to keep in proper lane/off road (8.3%). For interstate highways, falling asleep accounted for the largest percentage of contributing circumstances (43.2%) followed by inattention (25.0%) and failure to keep in proper lane/off road (13.6%).

Over half (65.8%) of the vehicles involved in inattention crashes hit another motor vehicle in traffic. Trees represented the second category of objects hit by these vehicles (8.0%) while almost 4% of the crashes involved a pedestrian that got hit and almost 6% overturned.

An examination of restraint use for vehicle occupants involved in major inattention crashes shows that overall, 76.0% were using a restraint.

4.7.4 Other Issues

A recent 100-Car Naturalistic Driving Study, co-sponsored by NHTSA, the Virginia Transportation Research Council and Virginia Tech, tracked the behavior of the drivers of 100 vehicles equipped with video and sensor devices for more than one year. Key findings include:

- Drowsiness increases a driver's risk of a crash by at least a factor of four.
- Reaching for a moving object increased the risk of a crash by 9 times; looking at an external object by 3.7 times; reading by 3 times; applying makeup by 3 times; dialing a hand-held device (typically a cell phone) by almost 3 times; and talking or listening on a hand-held device by 1.3 times.